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CULTURE OF RYE IN THE EASTERN HALF OF THE UNITED STATES

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RYE is hardier than wheat, will grow on some lands not adapted to wheat, and may be sown later than wheat.

Rye is attacked by fewer insects and diseases than wheat, and usually matures before rust becomes severe.

Rye produces a more profitable crop in some sections than wheat, uses less nitrogen pound for pound than wheat, and the straw is more highly valued than wheat straw.

Rye will endure more acid in the soil than wheat, and is generally a better crop for fall, winter, and spring pasture, as it makes a larger, earlier, and more upright growth.

CULTURE OF RYE IN THE EASTERN HALF OF THE UNITED STATES.

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PRODUCING REGION AND CROP.

The United States produces less than 3 per cent of the total rye crop of the world. The bulk of our production is in the eastern half of the country, in 1915 nearly 80 per cent being grown east of the Dakotas, Nebraska, Kansas, Oklahoma, and Texas. In the eastern part of the United States the principal production was in Minnesota and the States east of the Mississippi and north of the Ohio and Potomac Rivers. In the last few years, however, there has been a tendency to increase the acreage outside of the region of previous largest production. This has been especially marked in Nebraska, North Dakota, South Dakota, and Kansas, while largely increased acreages have been sown in Indiana and Ohio. In Nebraska, for instance, the area sown is estimated to have increased from 62,827 acres in 1909 to about 200,000 acres in 1915, while in Indiana the estimated increase in the same period is from 83,440 to 150,000 acres.

The largest crop of rye ever produced in the United States in one year was in 1915, when the yield was estimated to be 49,190,000 bushels. The lowest yield in the last 50 years was in 1872, when 14,889,000 bushels were produced, while the average for that period was 26,717,560 bushels. During the last four years the increase in production has been marked.

RYE VARIETIES.

Rye is known to many seedsmen and farmers only as winter rye or spring rye. There are, however, a number of varieties of this crop, most of them of comparatively recent introduction.

SPRING RYE.

Spring rye is sometimes grown in the northernmost States. It generally does not yield as well as other spring grains and should not be sown where winter rye will survive.

WINTER RYE.

VARIETIES FOR THE COTTON BELT.

For a great part of the cotton belt the Abruzzes (Abruzzi) variety, introduced from Italy by the United States Department of Agriculture in 1900 and 1904, has given remarkably good results. On account of its rapid and vigorous growth, even in cold weather, it is very valuable for grazing and cover-crop purposes. It also produces good yields of grain—from 15 to 30 bushels per acre under ordinary farming conditions in the cotton belt. In the extreme southern portion of the cotton belt there is an excellent variety known locally as South Georgia rye, and perhaps by other names. When sown in this section, it is several days earlier and somewhat taller than the Abruzzes variety.

VARIETIES FOR THE NORTHERN STATES.

The Minnesota No. 2 rye was originated by the Minnesota Agricultural Experiment Station by the selection of several good plants from the Swedish rye. It was introduced in 1908 and gave excellent results, averaging 27.2 bushels per acre the first year it was distributed, as compared with 17.7 bushels per acre produced by other rye sown under similar conditions. This rye also exceeded in yield all other varieties sown at the station for 7-year and 10-year periods. Other good varieties included in these tests are Dean, Petkus, Schlanstedt, and St. John's.

In South Dakota Dean and Swedish rye have given good results.

The Petkus (Wis. No. 1), Schlanstedt (Wis. No. 2), Ivanof (Wis. No. 3), and Dean (Wis. No. 4) varieties give good results in Wisconsin.

The Michigan Agricultural Experiment Station has recently introduced a variety of rye known as Rosen, originated at the station by selection from an imported Russian variety. It is reported to give very good yields of grain in that State.

The varieties just named will doubtless succeed where conditions are similar to those in the States mentioned.

Other varieties of rye grown in the United States are the Mammoth White and Thousandfold in the Northeastern States and the North Carolina Winter and Virginia Winter in the northern part of the cotton belt.

VARIETIES TESTED AT ARLINGTON FARM, VA.

The following varieties of rye, heads of some of which are shown in figure 1, have averaged at Arlington Farm, Va., in excess of 30 bushels per acre for the three or four years grown: Giant Winter, Abruzzes, Arlington Winter, Virginia Winter, Mexican, Rimpau, Ivanof, and Henry.

PRODUCTION OF THE RYE CROP.

SOILS ADAPTED TO RYE.

Rye can be grown on almost any of the well-drained soils of the eastern half of the United States. It is better adapted to the lighter loams and sandy soils than to the heavier clay soils. It yields best



FIG. 1.—Heads of four varieties of winter rye grown at Arlington Farm: 1, Giant Winter; 2, Virginia Winter; 3, Abruzzes; 4, Henry.

and produces the best quality of grain on well-drained loam soils in which there is a good supply of lime. It is not limited to such conditions, however, for it does about as well on acid as on nonacid soils and is probably the best grain for sandy soils, also for rough and exposed land. It is much better adapted to sandy and poor soils than wheat, and will endure a greater amount of acidity in the soil than wheat, oats, or barley. It is especially good for heath land, drained marshland, and for cut-over land being brought under cultivation. Rye should generally be the first crop on such lands. It may often be grown in the sandy soils of the coastal plains where other cereals would not succeed. The growing of rye should not be

attempted on lands subject to overflow or on which water stands after rains. On lands rich in nitrogen it is likely to lodge.

Rye does not grow as well as wheat in a wet soil. In drier soils it is more winter resistant than wheat. On poor lands rye generally does better than wheat, but on rich lands this condition is reversed.

THE PLACE OF RYE IN THE ROTATION.

Rye, like other common farm crops, does best when grown in a rotation. It can, however, be grown year after year on the same land more successfully than other small-grain crops, probably because few diseases that affect this plant accumulate in the soil. When rye is grown for grain it may take the place of wheat, barley, or oats in the rotation. Slightly more potassium and about one-fifth less nitrogen are removed from the soil by rye than by wheat when crops of equal weight are produced. As a whole, however, the quality and quantity of the plant foods removed from the soil by rye do not differ greatly from those removed by the other small grains.

It is good farm practice to sow rye where possible, following a cultivated crop. An excellent seed bed can then be made as soon as the cultivated crop is off the ground by using a disk harrow, followed by a spike-tooth harrow. The grain is thus seeded with a minimum of labor. If sown early grass and clover seed can be put in at the same time. If desired the rye can be cut while the grain is in the milk stage, early in June in New England and the northernmost States and earlier farther south, and used for straw. A good crop of hay from the grass and clover can usually be secured later.

One advantage of the rye crop is that it can be used to fill gaps between other crops. It can be sown early or late in the fall, on land either rough or well prepared, and it will practically always make a good growth, conserving fertility and preventing washing during the winter. The farmer can then decide in the spring whether to use it as pasture, as a soiling crop, as a green-manure crop to plow under, or as a straw and grain crop.

A cropping system applicable to the corn belt in which rye is used has been described in Farmers' Bulletin 614. In its 4-year form the rotation is corn, corn, rye, and timothy and clover, or clover alone, as desired, which is extended into a 5-year rotation by allowing the clover and timothy to stand two years instead of one. In this rotation the corn may be hogged off the first year; the second year the corn is cut and rye sown, or the rye is sown in standing corn. Timothy may be sown with the rye and clover sown in the early spring. This rye and grass mixture can be pastured when the weather allows until the rye straw becomes too tough, when the live stock are taken off and the grain allowed to ripen. About two

weeks after the rye is ripe hogs can be turned in and allowed to harvest the crop, which they do thoroughly and profitably. The wait of two weeks is necessary to allow the beards to lose their sharpness and the grain to soften. The grass crop the next one or two years completes the rotation.

A rotation suggested for Minnesota and suitable for other States in the same latitude is—

- First year, rye (land fall plowed after crop).
- Second year, barley, seeded to clover.
- Third year, clover; second crop plowed under.
- Fourth year, corn.
- Fifth year, barley or other grain.

If the land is infested with weeds, early plowing and subsequent cultivation after the rye and clover crops and thorough cultivation of the corn will aid greatly in destroying them.

In some of the North Atlantic States, where rye straw has a high value, this rotation may be followed successfully:

- First year, corn, with a heavy application of stable manure.
- Second year, oats, with acid phosphate.
- Third year, rye, with acid phosphate.
- Fourth year, grass, seeded the year before with the rye.

WHEN TO RAISE RYE INSTEAD OF WHEAT.

Rye is less generally raised in this country than wheat. In most places rye is less profitable as a grain crop, and there is less demand and use for the grain. Why, then, should rye ever be raised by the American farmer, and when, if ever, should rye be grown instead of wheat? The answers to these questions follow:

(1) Rye is hardier than wheat. It can be grown as a winter grain in colder, more exposed places. As an instance, rye is the only winter grain hardy enough to withstand without protection the conditions in the district between the James River and the Missouri River in South Dakota. If winter wheat is grown, it must have winter protection.

(2) Rye will grow on some lands not adapted to wheat. Sandy, exposed, poor, poorly prepared, or acid land will usually yield better crops of rye than of wheat. On large areas of sandy land in all parts of the country rye can usually be grown to better advantage than wheat. As rye uses less nitrogen, it can be grown on poorer lands. Rye should be sown on newly cleared timberland and drained marshland, as it is more resistant than wheat to the acid condition of the soil which is likely to exist. In this respect it is similar to buckwheat.

(3) Rye may be sown later in the fall than wheat. If the land can not be prepared in time for wheat, owing to rush of work, seasonal conditions, or because some late-maturing crop is occupying the land, rye may well be sown. Rye will germinate more quickly than wheat and at a lower temperature. It will germinate and grow with the temperature but a few degrees above freezing, when wheat would be practically at a standstill. It can be sown after buckwheat or late potatoes are removed, thus furnishing a winter cover and allowing a grain crop to be grown. Since it can be sown late, it distributes labor on farms where wheat also is grown, as the wheat can all be sown before rye sowing is begun.

(4) Rye is attacked by fewer insects and diseases than wheat. The Hessian fly seldom injures it badly. The rye crop usually matures before rust becomes severe.

(5) Rye produces a more profitable crop in some sections of the country than wheat. The 5-year (1910-1914) average estimated value per acre for rye is greater than for wheat in the States of South Carolina, Alabama, Texas, Minnesota, North Dakota, and South Dakota.

(6) Rye produces a straw more highly valued for bedding horses, stuffing horse collars, and for use as packing material and in paper making than wheat. Where there is demand for the straw for such purposes, as, for instance, near the large cities in the North Atlantic States, and special precaution is taken to preserve it, the straw may be more valuable than the grain. More straw per acre is produced on poor land by rye than by wheat.

(7) Rye will endure more acid in the soil than wheat and can therefore be used where wheat would require liming. In such cases rye can be produced more cheaply. For instance, on the Volusia soils of northern Pennsylvania and southern New York, which are uniformly acid in reaction, being markedly in need of lime, rye is the leading winter grain crop.

(8) Rye uses less nitrogen, pound for pound of crop produced, than wheat, the amount in rye being about four-fifths that in wheat. It can therefore be grown on poorer lands, can be produced with less fertilizer, and does not exhaust the supply of nitrogen so much as wheat.

(9) Rye is generally a better crop for fall, winter, and spring pasture than wheat, as it makes a larger, earlier, and more upright growth than wheat.

(10) For the reasons above cited, rye is generally better for a winter cover and green manure than wheat. In the South it can be sown in cotton at the time of the first or second picking or in standing corn, and it makes a good growth for plowing under in January in preparation for cotton or corn. In the North it can be sown in standing corn or after some other crop, and can be plowed under in May in preparation for corn or some other crop.

VOLUNTEER RYE.

Rye will often reseed itself for several years in fields where conditions are favorable after it is sown. This volunteer rye is objectionable if wheat follows, as the grains of rye and wheat can not be separated by cleaning machinery. If rye is present in wheat used for flour making in amounts as high as 2 per cent or more, it lowers the quality of the bread.¹ For this reason millers and grain dealers frequently make a considerable discount in the price of wheat containing rye. Special efforts should be made, therefore, to prevent the mixing of rye with wheat. Sowing mixed seed should be avoided, and volunteer rye should not be allowed to grow in wheat fields.

PREPARATION OF THE SEED BED.

While rye generally does better than any other cereal on a poorly prepared seed bed, this is not sufficient reason for neglecting the proper preparation of the soil. The extra expense incurred in preparing a good seed bed will be more than repaid by the additional yield obtained. If rye is to follow a drilled crop, the land should be plowed 5 to 7 inches deep at least four weeks before seeding, and

¹ For further information on the effect of rye flour in wheat flour, see U. S. Department of Agriculture Bulletin No. 328.

earlier if practicable. Immediately after plowing, the land should be gone over with a harrow or other implement suitable for breaking clods and reducing the topsoil to a fine, mellow condition. After this it should be so handled as to prevent the growth of weeds and to provide a seed bed firm and compact beneath, but loose and mellow in the upper 2 or 3 inches. The exact method for securing these results must be varied to suit individual conditions.

When rye is to follow a cultivated crop that has been removed, the land may be plowed 3 or 4 inches deep and harrowed if there are many weeds present, or it may be disked and harrowed, as conditions seem to demand. The aim should always be to obtain a seed bed such as that described above. Cowpea or corn stubble can usually be prepared for rye by disking and harrowing. Rye may be sown broadcast in cotton, corn, or other standing crops without previous soil preparation, but it should be covered after sowing. A broad sweep, double shovel, or cultivator is a suitable implement for covering, passing once between every two rows. Cotton or corn is not injured by this treatment. A 1-horse, 5-hole drill can also be used to advantage, as this will pass between the rows of the standing crops.

FERTILIZERS FOR RYE.

Although rye will grow on very poor soils, large yields of forage or grain may be expected only on soil that is of good fertility. Rye for grain production should not be sown on very rich land; neither should large quantities of fertilizers containing nitrogen be applied to the crop. Stable manure is the best fertilizer for general use with rye, but phosphorus should generally be applied in connection with it. The addition of 40 to 50 pounds of acid phosphate or rock phosphate to each ton of manure and the application of 2 to 4 tons per acre of this combination should be generally profitable on poor land. Larger applications may be made on very poor land. When commercial fertilizers only are available, an application of acid phosphate at the minimum rate of 200 to 300 pounds per acre when the crop is sown is generally advisable. Cottonseed meal may also be used to supply nitrogen, this being applied two or three weeks before seeding, or at the time of seeding, but not in contact with the seed. Nitrate of soda may often be used to good advantage. This should be applied with discretion, however, as an excess of nitrogenous matter will result in serious loss from lodging. Rye requires considerably less nitrogen for good results than wheat. On the poorest soils 25 pounds of nitrate of soda may be applied at seeding time and 50 to 75 pounds used as a top-dressing after growth starts in the spring. On richer soils the spring application is generally sufficient. On soils that are naturally rich, or that have been fertilized for preceding crops, fertilizers for the rye crop may not be necessary.

Where rye is grown for pasture, for soiling purposes, or for the straw, larger applications of nitrogenous fertilizers may be made. If the land is not especially fertile, six to eight loads of barnyard manure should be applied after plowing and harrowed in thoroughly. Commercial fertilizer rich in phosphorus should be used if manure is not available. An application of 200 to 400 pounds of a 3-8-4 fertilizer (that is, a fertilizer containing 3 per cent of nitrogen, 8 per cent of phosphorus, and 4 per cent of potassium) can be recommended. If the soil is poor and the plants have a bad color and do not start off well in the spring, an application of 75 to 150 pounds of nitrate of soda as spring growth is starting will increase the yields. This nitrate should be applied evenly, either broadcast by hand or with a fertilizer distributor, when the plants are dry, just before or after a rain. Such an application will also lengthen the time during which the crop may be fed to stock. Such heavy applications of manure and fertilizers are not advisable when the crop is grown for grain, as lodging almost surely would result.

A rye crop of 30 bushels of grain and 3,800 pounds of straw removes from the soil, in the grain only, the equivalent of about 180 pounds of nitrate of soda, 14 pounds of phosphoric acid, 15 pounds of muriate of potash, and 2 pounds of limestone, and, in the straw only, the equivalent of about 90 pounds of nitrate of soda, 10 pounds of phosphoric acid, 50 pounds of muriate of potash, and 20 pounds of limestone.

PREPARATION OF THE SEED.

Seed rye should be thoroughly cleaned and all immature kernels removed before it is sown. As rye loses its germinating power much more rapidly and readily than other cereals, all seed should be tested for germination before sowing and the rate of seeding regulated accordingly.

To make a germination test several lots of 100 grains each should be counted out and placed between clean blotters or Canton flannel or in sand, where they must be kept moist and at a temperature of about 70° F. for several days. The number of seeds which show strong sprouts should then be counted. Seed that is weak in vitality should be discarded or sown at a higher rate per acre than that commonly employed.

TIME OF SEEDING.

The time of seeding rye depends upon the use to be made of the crop. When intended for grain production it should be sown from about September 1 in the northernmost part of the country to the latter half of November or later in the southern.

Rye may be sown a week or two weeks later than wheat, unless wheat sowing is unusually delayed, as rye germinates more quickly and makes a more rapid early growth, especially if the weather is cool.

If intended as a pasture crop, as a cover and green-manure crop, or as a combination of these, rye should be sown from two weeks to a month earlier than if it is to be used for grain. When not sown for grain, about August 20 is preferable in the northernmost States, although fair results may be secured by sowing as late as September 5. In the latitude of St. Louis late August or early September is preferable.

In the northern part of the Gulf States it should be sown for pasture, cover crop, and green manure between September 15 and October 15, and about two weeks later in the southern part. A satisfactory time to sow in the cotton fields is just after the first or second picking, about the middle of September.

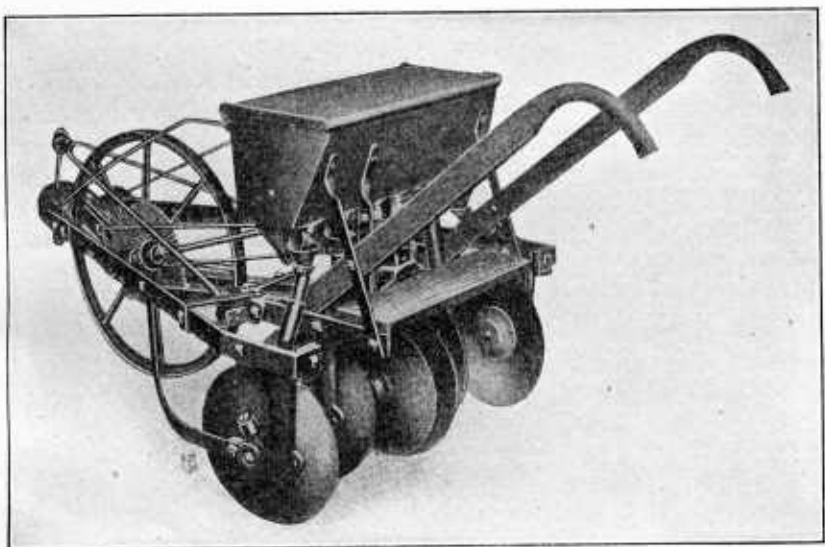


FIG. 2.—A drill made for sowing between rows of standing crops.

It is desirable to sow rye sufficiently early for the plant to become well established before winter begins. Where a deep root system is formed early there is less loss from the heaving of the soil caused by alternate freezing and thawing, and the plant also starts growth earlier in the spring. Rye can be sown with success on fertile land in a good seed bed later than it can on poor land in a poor seed bed.

Spring rye may be sown as early as spring oats, or as soon as the soil becomes warm and dry enough to be worked. It is usually sown before either barley or wheat.

METHOD OF SEEDING.

Rye is best sown in drills 6 to 8 inches apart, using a regular grain drill and covering the seed one-half inch to 2 inches deep, depending on the texture and moisture content of the soil. Less seed

and labor are required, and a more even and uniform stand is thus secured than by any other method. When a drill is not available, rye may be sown broadcast by hand or with a broadcast seeder and covered by harrowing. The person sowing the seed may save labor and can sow more evenly and rapidly by standing or sitting on the rear end of a wagon as it is drawn slowly back and forth across the field. When sown in a standing crop, such as corn or cotton, rye may be sown broadcast and covered with a plow, sweep, or 1-horse cultivator, passing once between rows, or it may be sown with a drill, such as is shown in figure 2, made for sowing between rows of standing crops. Some farmers when sowing in standing corn or cotton rows sow the grain from horseback.

RATE OF SEEDING.

While the kernels of rye are smaller and more slender than those of winter wheat, the same quantity of seed is usually sown. In the Eastern States the usual rate of seeding is about 6 pecks to the acre. Too thick seeding upon fairly fertile soil will produce soft culms, which are likely to lodge or crinkle. On the sandy loam soil in the central cotton belt sowing 2 pecks of Abruzzes rye on good soil and 3 pecks on light soil has given the best yields of grain from November 15 seeding. For later sowings more seed is required.

When intended for soiling purposes more seed should be sown per acre than when the rye is intended for grain. Two bushels per acre is the usual seeding.

HARVESTING THE CROP.

DATE OF RIPENING.

At the northern boundary of Florida rye ripens about the middle of May. In the northernmost States it ripens between July 10 and July 25. For a number of varieties grown for several years in the vicinity of Washington, D. C., the average date of ripening has been from June 16 to 21, although one variety, the Rimpau, has ripened as late as June 27. These figures indicate that as one passes northward from Florida rye ripens approximately one day later for each 15 miles traveled, allowance being necessary, however, for increased altitude.

Rye is generally a few days earlier than wheat in ripening. In comparison with the dates given for the ripening of rye in the vicinity of Washington, 30 out of 43 varieties of wheat have ripened on the average from June 20 to 24, the limits for the 43 varieties being June 17 and June 30, wheat thus averaging some three or four days later than rye, although there is but one day intervening between the earliest wheat and the earliest rye.

Rye cutting may begin a few days before it is fully ripe, or while there is still a slight green tinge about the plant. This is especially desirable when the straw is to be marketed, as a bright, heavier straw results.

CUTTING.

Rye is cut and bound like wheat. The straw of rye commonly grows to a height of 5 feet and frequently reaches 6 feet. On fertile soil it may reach or even exceed 7 feet in height. On account of this long, slender growth it is likely to be more or less lodged and tangled at harvest time, especially on rich soils. It is then extremely difficult to harvest with a self-binder. Even when the grain is standing, it is difficult to cut a heavy crop in this way, as many machines do not have sufficient capacity for such long straw. If there is no special object in saving the straw, the cutter bar may often be raised sufficiently to allow the machine to handle the crop. If the rye is grown principally for the straw, however, a tall crop must often be cut with a self-rake reaper and bound by hand. This requires about four extra men, and is necessarily very expensive. The old-fashioned cradle may also be used in cutting heavy or lodged and tangled rye.

SHOCKING AND STACKING.

Rye is generally shocked in the same manner as wheat and other cereals. Special care should be taken to have the shocks well built and capped, so that as much as possible of both grain and straw will be protected from the weather. As soon as the crop is well cured in the shock, which will ordinarily be in about 10 days after cutting, it should be stacked or put under cover until thrashing time. As the straw is often quite as valuable as the grain, and as its value depends largely on its condition, care in handling between cutting and thrashing is usually well repaid.

THRASHING.

When no special use is to be made of the straw, the method of thrashing rye is the same as that for wheat and other grains. When rye straw is intended for a particular purpose, such as packing material for nursery stock or stuffing for horse collars, an ordinary thrashing machine can not be used, as it breaks and twists the straw too much. The flail was long used for thrashing rye and may still be utilized, but special machines are in use by means of which the grain can be removed without injuring the appearance of the straw.

These machines, sometimes known as "beaters," differ from the ordinary grain separator in that the cylinder is from 5 to 6 feet long and the straw is fed into the cylinder lying parallel to its axis rather than at right angles, as is usually the case. There is no concave, and the cylinder contains no teeth. It is made up of bars with shallow

corrugations diagonally across the face, the corrugations on adjacent bars being at different angles. The straw from the unbound bundles is carried over the cylinder, which is run at very high speed, and the grain is beaten out between the cylinder and the top of the machine. The straw is then dropped upon a long inclined shaker, which consists of a number of bars with teeth. These teeth push the straw to the rear of the machine, where it is tied in small bundles by means of a binding attachment similar to those used on binders. A thrasher of this type is shown in figure 3.

PESTS.

WILD ONION, OR GARLIC, IN RYE.

Wild onion, or garlic, is a pest in many of the Eastern and Southern States. The onion bulblets are about the same size and shape as rye

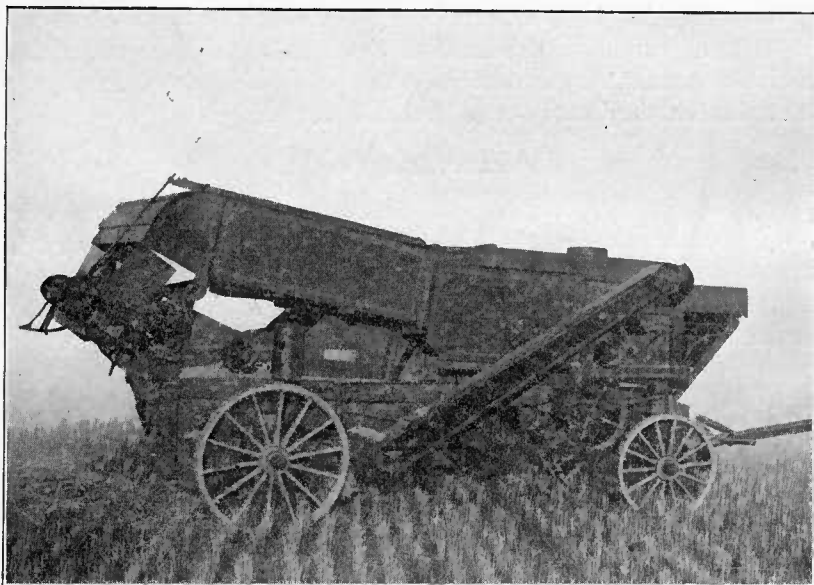


FIG. 3.—A thrashing machine constructed to thrash rye without breaking or twisting the straw. Note the attachment at the rear for binding the straw into bundles.

grains and reach maturity at the same time. They are therefore harvested with the crop and can be separated from the thrashed grain only with much difficulty. When such rye is sold it is docked severely, often 15 cents or more a bushel. A small percentage of onion bulblets will spoil flour made from the grain, giving the bread a disagreeable odor and flavor. If only a few onions are present in the growing crop, they should be dug out and burned. Land badly infested should, if possible, be used for some other crop than small grains. Rye, however, lends itself to the more or less complete eradi-

cation of wild onion, as the crop may be sown late on land plowed and prepared just before planting.¹

INSECT ENEMIES OF RYE.

Rye has no special insect enemies, but is attacked more or less by the same insects, such as chinch bugs, grasshoppers, and army worms, which feed on the other small grain crops. The Hessian fly does not affect rye as badly as wheat. The granary weevil and the Angoumois grain moth in both the larval (worm) and adult stages live within the stored kernels and may be very destructive.

RYE DISEASES.

Rye is subject to attacks of both stem and leaf rust. These diseases manifest themselves by the appearance of orange yellow to reddish

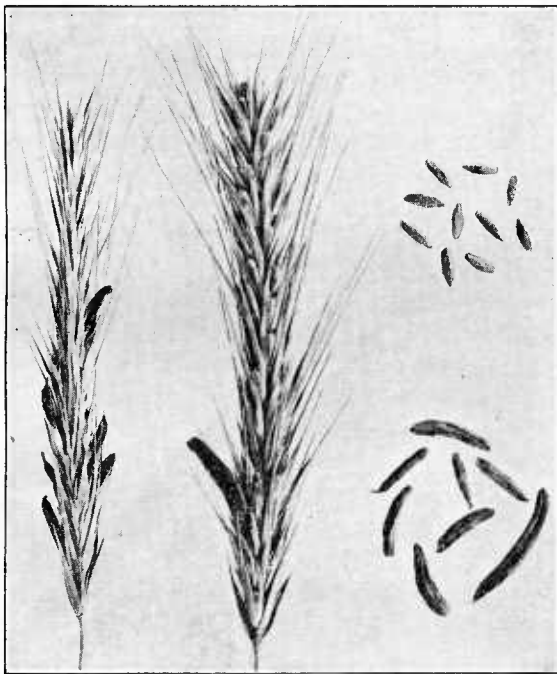


FIG. 4.—Heads of rye showing ergot; also kernels of rye, sound (above) and ergotized (below).

brown pustules, which in one case affect the leaves and in the other the leaves and stems of the attacked plant. This crop is seldom badly injured by these diseases. The flag smut of rye sometimes occurs, usually on the leaf sheath, as reddish black streaks of spores. Losses of as much as 3 to 5 per cent are sometimes caused by this smut. The occurrence of loose smut of rye has been reported but twice in three years and is of no economic importance.

¹ For further information on methods of eradicating wild onion, see Farmers' Bulletin 610.

A disease called anthracnose is prevalent in some parts of the rye-growing area. The attacks of this disease are shown by the premature dying of those portions of the heads above the point of its attack, resulting in the almost total loss of the grain in these dead portions. The disease also attacks the roots and lower portions of the stems, resulting in a blackened appearance of the attacked parts and in the loss of vigor of the diseased plant, which therefore produces only shriveled grains. Treatment of the seed with formaldehyde (1 part of formaldehyde to 50 parts of water), as is common for oat and wheat diseases, is a preventive.

The most serious and destructive disease of rye is ergot (fig. 4). In this, one or more kernels of the head are replaced by a horny violet or purplish structure, usually somewhat larger than the kernel. Where ergot is present rye should not follow rye in the rotation, and seed free from ergot should be sown. It is dangerous to feed rye containing ergot to live stock.

Ergot may be completely separated from rye by passing the grain through a 20 per cent solution of common salt, in which the ergot will float and the rye will sink. This treatment does not affect germination, and the rye can be sown as soon as the excess water has drained off.